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ALEXANDRIA, VA 22314

EXAMINER
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ALEJANDRO, RAYMOND

ART UNIT	PAPER NUMBER
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1745

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DATE MAILED: 06/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/091,502

Applicant(s)

CHE ET AL.

Examiner

Raymond Alejandro

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 07 March 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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## **DETAILED ACTION**

### ***Priority***

1. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Information Disclosure Statement***

2. The information disclosure statement (IDS) submitted on 03/07/02 was considered by the examiner.

### ***Drawings***

3. The drawing filed on 03/07/02 have been accepted.

### ***Double Patenting***

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

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5. Claims 1-2, 7 and 11-12 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 3, 7 and 15 of U.S. Patent No. 6294292 in view of Honbo et al 6399251.

The U.S. Patent No. 6294292 claims the following (claims 1, 3, 7 and 15):

1. A secondary power source, which comprises  
a positive electrode containing activated carbon, 20  
a negative electrode containing a carbon material capable  
of doping and undoping lithium ions, and  
an organic electrolyte containing a lithium salt, wherein  
a ratio of the positive electrode capacity ( $C^+$ ) to the 25  
negative electrode capacity ( $C^-$ ), i.e.  $C^+/C^-$ , is from 0.1  
to 1.2,  
the positive electrode has a thickness of from 100 to 200  
 $\mu\text{m}$ , and  
the negative electrode has a thickness of from 10 to 50 30  
 $\mu\text{m}$ .

3. The secondary power source according to claim 1,  
wherein the carbon material has a lattice spacing of [002]  
face of from 0.335 to 0.410 nm. 40

7. The secondary power source according to claim 1,  
wherein the activated carbon of the positive electrode has a  
specific surface area of from 800 to 3,000  $\text{m}^2/\text{g}$ .

30 15. A secondary power source, which comprises  
a positive electrode containing activated carbon,  
a negative electrode containing a carbon material capable  
of doping and undoping lithium ions, and  
35 an organic electrolyte containing a lithium salt, wherein  
a ratio of the positive electrode capacity ( $C^+$ ) to the  
negative electrode capacity ( $C^-$ ), i.e.  $C^+/C^-$ , is from 0.1  
to 1.2, and  
the positive electrode contains a lithium transition metal  
40 oxide in an amount of from 0.1 to 20 wt %.

The US'292 patent claims a secondary power according to the above-mentioned aspects.  
However, the US'292 patent does not expressly claim the specific negative electrode density.

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Honbo et al disclose a lithium secondary battery wherein the negative electrode active material is characterized in containing carbon, and its negative electrode density is in the range larger than  $0.95 \text{ g/cm}^3$ , and smaller than  $1.5 \text{ g/cm}^3$  (COL 3, lines 57-61).

In view of these disclosures, it would have been obvious to one skilled in the art at the time the invention was made to make the negative electrode of the US'292 patent by having the specific negative electrode density of Honbo et al as Honbo et al teach that if the negative electrode density is smaller than  $0.95 \text{ g/cm}^3$ , vacancies in the negative electrode are numerous and the specific surface area as the electrode is large. Accordingly, a large amount of positive electrode material is precipitated on the surface and inside of the negative electrode. The precipitated positive electrode material decreases the capacity of the negative electrode significantly, and makes the cycle life short. If the negative electrode density is larger than  $1.5 \text{ g/cm}^3$ , the vacancy in the negative electrode is too small to make the electrolyte penetrate into the inside of the electrode. Therefore, the capacity of the negative electrode is decreased significantly, and the objective lithium secondary battery for mounting on power sources can not be obtained. Hence, those of ordinary skill in the art would obviously envision that the claimed negative electrode density is within the disclosed range, and therefore, an electrode having the claimed negative electrode density would exhibit the same desirable characteristics.

6. Claims 1-2, 7-8 and 11-12 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 3, 5 and 7-8 of U.S. Patent No. 6558846 in view of Honbo et al 6399251.

The U.S. Patent No. 6558846 claims the following (claims 1, 3, 5 and 7-8):

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1. A secondary power source, which comprises a positive  
electrode comprising activated carbon and a lithium-  
containing transition metal oxide, a negative electrode com-  
prising a carbon material capable of doping and undoping  
lithium ions, and an organic electrolyte comprising a lithium  
salt, wherein the lithium-containing transition metal oxide is  
an oxide of lithium and at least one element selected from  
the group consisting of Mn, Fe, Co, Ni, Zn, and W, and the  
lithium-containing transition metal oxide is present in the  
positive electrode in an amount of from 0.1 to 15 wt %.

3. The secondary power source according to claim 1,  
wherein the activated carbon of the positive electrode has a  
specific surface area of from 800 to 3,000 m<sup>2</sup>/g.

5. The secondary power source according to claim 1,  
wherein the carbon material of the negative electrode has a  
spacing of [002] face of from 0.335 to 0.410 nm.

7. The secondary power source according to claim 1,  
wherein the organic electrolyte comprises at least one sol-  
vent selected from the group consisting of ethylene  
carbonate, propylene carbonate, butylene carbonate, dim-  
ethyl carbonate, ethylmethyl carbonate, diethyl carbonate,  
sulfolane and dimethoxyethane.

8. The secondary power source according to claim 1,  
wherein the lithium salt is at least one member selected from  
the group consisting of LiPF<sub>6</sub>, LiBF<sub>4</sub>, LiClO<sub>4</sub>,  
LiN(SO<sub>2</sub>CF<sub>3</sub>)<sub>2</sub>, CF<sub>3</sub>SO<sub>3</sub>Li, LiC(SO<sub>2</sub>CF<sub>3</sub>)<sub>3</sub>, LiAsF<sub>6</sub> and  
LiSbF<sub>6</sub>.

The US'846 patent claims a secondary power according to the above-mentioned aspects.  
However, the US'846 patent does not expressly claim the specific negative electrode density.

Honbo et al disclose a lithium secondary battery wherein the negative electrode active  
material is characterized in containing carbon, and its negative electrode density is in the range  
larger than 0.95 g/cm<sup>3</sup>, and smaller than 1.5 g/cm<sup>3</sup> (COL 3, lines 57-61).

In view of these disclosures, it would have been obvious to one skilled in the art at the  
time the invention was made to make the negative electrode of the US'846 patent by having the  
specific negative electrode density of Honbo et al as Honbo et al teach that if the negative  
electrode density is smaller than 0.95 g/cm<sup>3</sup>, vacancies in the negative electrode are numerous

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and the specific surface area as the electrode is large. Accordingly, a large amount of positive electrode material is precipitated on the surface and inside of the negative electrode. The precipitated positive electrode material decreases the capacity of the negative electrode significantly, and makes the cycle life short. If the negative electrode density is larger than 1.5 g/cm<sup>3</sup>, the vacancy in the negative electrode is too small to make the electrolyte penetrate into the inside of the electrode. Therefore, the capacity of the negative electrode is decreased significantly, and the objective lithium secondary battery for mounting on power sources can not be obtained. Hence, those of ordinary skill in the art would obviously envision that the claimed negative electrode density is within the disclosed range, and therefore, an electrode having the claimed negative electrode density would exhibit the same desirable characteristics.

It is also noted that the combination of claims 7-8 of the US'846 patent as a single claim (as recited in claim 8 of the instant application 10/091502) represents an obvious variation resulting by combining single claims of the issued US'846 patent.

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any

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evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1-2, 5-8, 11-12 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Japanese publication JP 2000-090972 in view of Honbo et al 6399251.

The instant application is directed to a secondary power source wherein the disclosed inventive concept comprises the specific negative electrode density. Other limitations include the specific carbon material and its characteristics; the binder; the specific surface area; and the solvent and lithium salt.

With respect to claims 1 and 11:

The JP'972 publication discloses a secondary power source having a positive electrode including the activated carbon, a negative electrode including a carbon material for storing and releasing lithium ion (*that is, capable of doping and undoping lithium ions*), and the organic electrolyte containing the lithium salt (ABSTRACT). It is disclosed that the secondary power source is a lithium rechargeable battery (SECTION 0005).

With respect to claims 2, 12:

It is disclosed that the carbon material has a lattice spacing of [002] of 0.335-0.410 nm according to X-ray diffraction (SECTION 0025).

With respect to claims 5 and 15:

It is disclosed that the weight ratio of the carbon material and binder is from 70:30 - 96:4 (SECTION 0031). *Thus, the negative electrode contains from 4-30 weight % of a binder.*



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**Example 1** shows a negative electrode comprising a weight ratio of 9:1 of carbon material to binder (SECTION 0035). *Thus, the negative electrode contains 10 weight % of the binder.*

With respect to claims 6 and 16:

It is disclosed the use polyvinylidene fluoride as a binder (SECTION 0027).

With respect to claim 7:

It is disclosed that the activated carbon contained in the positive electrode has a specific surface area of 800-3000 m<sup>2</sup>/g.

With respect to claim 8:

It is disclosed that the solvent of the organic electrolyte contains propylene carbonate (ABSTRACT); ethylene carbonate, butylene carbonate, dimethyl carbonate, ethyl methyl carbonate, diethyl carbonate, sulfolane, dimethoxyethane (SECTION 0010). The lithium salt maybe LiPF<sub>6</sub>, LiBF<sub>4</sub>, LiClO<sub>4</sub>, LiN(SO<sub>2</sub>CF<sub>3</sub>)<sub>2</sub>, CF<sub>3</sub>SO<sub>3</sub>Li, LiC(SO<sub>2</sub>CF<sub>3</sub>)<sub>3</sub>, LiAsF<sub>6</sub> and LiSbF<sub>6</sub> (SECTION 0032).

The JP'972 publication discloses a secondary power source according to the foregoing. However, the JP'972 publication does not expressly disclose the specific negative electrode density.

Honbo et al disclose a lithium secondary battery wherein the negative electrode active material is characterized in containing carbon, and its negative electrode density is in the range larger than 0.95 g/cm<sup>3</sup>, and smaller than 1.5 g/cm<sup>3</sup> (COL 3, lines 57-61).

In view of these disclosures, it would have been obvious to one skilled in the art at the time the invention was made to make the negative electrode of the JP'972 publication by having the specific negative electrode density of Honbo et al as Honbo et al teach that if the negative

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electrode density is smaller than 0.95 g/cm<sup>3</sup>, vacancies in the negative electrode are numerous and the specific surface area as the electrode is large. Accordingly, a large amount of positive electrode material is precipitated on the surface and inside of the negative electrode. The precipitated positive electrode material decreases the capacity of the negative electrode significantly, and makes the cycle life short. If the negative electrode density is larger than 1.5 g/cm<sup>3</sup>, the vacancy in the negative electrode is too small to make the electrolyte penetrate into the inside of the electrode. Therefore, the capacity of the negative electrode is decreased significantly, and the objective lithium secondary battery for mounting on power sources can not be obtained. Hence, those of ordinary skill in the art would obviously envision that the claimed negative electrode density is within the disclosed range, and therefore, an electrode having the claimed negative electrode density would exhibit the same desirable characteristics.

10. Claims 3-4, 9-10 and 13-14 rejected under 35 U.S.C. 103(a) as being unpatentable over the Japanese publication JP 2000-090972 in view of Honbo et al 6399251 as applied to claims 1 and 11 above, and further in view of Nishimura et al 6103373.

The JP'972 publication and Honbo et al are applied, argued and incorporated herein for the reasons above.

As to claims 3-4 and 13-14:

Additionally, the JP'972 publication does disclose that a vapor-growth carbon fiber maybe used as the carbon material (SECTION 0005). It is disclosed that the graphite system carbon material has a desirable lattice spacing of [002] of 0.335-0.338 nm (SECTION 0025).

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**EXAMPLE 6** shows a negative electrode wherein the graphite system has a lattice spacing of [002] of 0.337 nm (EXAMPLE 6).

As for claims 9 and 10:

The JP'972 publication discloses that the weight ratio of the carbon material and binder is from 70:30 - 96:4 (SECTION 0031). *Thus, the negative electrode contains from 4-30 weight % of a binder.* **Example 1** shows a negative electrode comprising a weight ratio of 9:1 of carbon material to binder (SECTION 0035). *Thus, the negative electrode contains 10 weight % of the binder.* It is disclosed the use polyvinylidene fluoride as a binder (SECTION 0027).

**However, the foregoing prior art does not expressly disclose the specific amount of carbon fibers in the negative electrode as recited in claims 3 and 13; the specific lattice distance as recited in claims 4 and 14 (which depends from claims 3 and 13) and specific binder amount and material as recited in claims 9-10 (which depends from claim 3).**

With respect to claims 3-4 and 13-14:

Nishimura et al disclose carbon fiber materials used as an electrode material for making electrodes in secondary batteries (ABSTRACT) wherein the electrode material is suitable for making negative electrodes (COL 5, lines 56-59). It is further disclosed that the amount of fiber material, comprised mainly of VGCF (*vapor grown carbon fiber*) to be added is between 0.15-30 w/o weight percent (COL 10, lines 45-55); the mixing ratio of the agglomerate should be between 5-20 w/o of the total weight of the electrode mixture (COL 11, lines 55-60). It is further

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disclosed that the material has a plane spacing (d0002) of less than 0.34 nm (COL 10, line 65- COL 11, line 3).

With respect to claims 9-10:

Nishimura et al discloses in **EMBODIMENTS 4-6** that the binder content is either 7 wt. % or 10 wt. % (COL 14, lines 11-14, lines 30-33 & lines 48-51). It is also disclosed that the binder is a fluororesin (COL 11, lines 25-27).

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to make the negative electrode of both the JP'972 publication and Honbo et al by containing the specific amount of carbon fibers in the negative electrode as Nishimura et al disclose that when the amount of addition exceeds 30 weight %, the volume of the carbon fiber is too high and the amount of the electrode active ingredient is reduced, the effect becomes reversed and the charge storage capacity begins to drop. When the amount is less than 0.1 weight %, the effect of providing increased contact points to the particles is lessened so that the electrical resistance cannot be lowered, resulting in not producing improvement in the charge storage capacity. Hence, those of ordinary skill in the art would obviously envision that the claimed negative amount of carbon fibers in the negative electrode is within the disclosed range, and therefore, an electrode having the claimed amount of carbon fibers would exhibit the same desirable characteristics.

As to the specific lattice distance, it would have been obvious to one skilled in the art at the time the invention was made to make the carbon fibers of both the JP'972 publication and Honbo et al by having the specific lattice distance as Nishimura et al teach that a carbon fiber material having a plane spacing (d0002) of less than 0.34 nm is preferred because it provides a

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graphite material with a layer structure to enable the lithium ions to be intercalated. Accordingly, since Nishimura et al teach preferred lattice distances lower than 0.34 nm to provide a graphite material enabling intercalation of lithium ions, Nishimura et al directly teaches the use of a lattice distance within the claimed range (*See MPEP 2144.05 Obviousness of Ranges*).

Furthermore, Nishimura et al's teaching is consistent with the disclosure of the JP'972 publication wherein is stated that a lattice spacing of 0.335-.338 nm is desirable for reducing resistance.

As to the specific binder amount and material, it would have been obvious to one skilled in the art at the time the invention was made to make the negative electrode of both the JP'972 publication and Honbo et al by containing the specific binder amount as Nishimura et al teach that binders act as bonding agent for the negative material mixture. In that, since Nishimura et al teach examples using the specific binder amount, those of ordinary skill will recognize that by using the claimed binder amount in the electrode material, the binder itself will meet its intended functionality as a bonding agent. Thus, the prior art directly teaches the use of a binder within the claimed range (*See MPEP 2144.05 Obviousness of Ranges*). Furthermore, Nishimura et al's teaching is consistent with the disclosure of the JP'972 publication wherein is stated that the amount of binder in the negative electrode ranges from 4-30 weight %, and if more than 30 wt. % is used, the electrode capacity is reduced as well as if less than 4 wt. % is used, the binding characteristic weakens producing ablation between the negative electrode and the current collector. Regarding the binder material, it would be obvious to use the claimed binder material in the negative electrode of both the JP'972 publication and Honbo et al as Nishimura et al disclose that fluororesins serve as a bonding agent for negative electrode mixture; additionally,

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Nishimura et al's teaching is consistent with the disclosure of the JP'972 publication showing that a fluororesin such as polyvinylidene fluoride provides suitable binding properties to be employed in negative electrode.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (703) 306-3326. The examiner can normally be reached on Monday-Thursday (8:30 am - 7:00 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (703) 308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Raymond Alejandro  
Examiner  
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A handwritten signature in black ink, appearing to read 'RAM', is written over the printed name of the examiner.